

readers may not all be aware that the aerated waters of commerce are charged only with carbonic acid gas, and that the soda, potash, &c., exist only, as a rule, in the imagination of the consumer. I add them when required, and find the following a handy method:—Make a strong solution, say, of bi-carbonate of soda (two drachms to three ounces of distilled water, five grains to a fluid drachm); stir in a teaspoonful with the milk *before* you pour in the aerated water, and you know then you have given your patient *soda* and milk, and what quantity. You cannot be weighing five-grain doses of soda four or five times a day. You may think it rather unnecessary to WEIGH such a simple drug at all, but I assure you alkalies should *not* be given recklessly to sick or well; and as we have to administer them medicinally, we ought to know what we are about. We do not often require soda or potash—the aerated water is all that is ordered, but with *milk* the addition of an alkali is often desirable.

(To be continued.)

PRACTICAL LESSONS IN ELECTROTHERAPEUTICS.

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LESSON II.

Chemical Electrical Generators—Cells: Simple Voltaic, Leclanché, Silver Chloride, Daniell, Minotto, Bichromate, Grove, Bunsen—Secondary Cells or Accumulators—Batteries Arranged in Series and in Parallel.

WE finished our last lesson with the consideration of the relative advantages and disadvantages of the different classes of electric generators, and arrived at the conclusion that for Medical purposes those belonging to the chemical class are most suitable. We have now, therefore, to turn our attention to

CHEMICAL ELECTRIC GENERATORS.

These vary much in form, construction, and the chemical agents employed. There are, however, certain general qualities which it is advisable that all chemical electric generators should possess. They may be briefly summarised as follows:—

1. High electro-motive force (written for brevity, E.M.F.).
2. Constancy.

3. Low internal resistance.
4. Absence of internal action when at rest.
5. Cleanliness.
6. Freedom from noxious or corrosive fumes.

Chemical generators are usually composed of one or more cells. A single cell is generally termed a *cell*, but two or more cells constitute a battery. We will first consider different types of single cell, and then deal with them when constituting batteries.

The single cell of a chemical electric generator is sometimes arranged in one containing vessel or jar only, sometimes in more than one. These containing vessels or jars are often called cells, but as this is apt to lead to confusion, we propose in these lessons to speak of them as jars, leaving the word "cell" to mean a single complete chemical electrical generator, whether composed of one or more jars.

The simplest form of cell is that known as the simple voltaic cell, and referred to as such in Lesson I. It was invented by Volta, a Professor in the University of Pavia, about one hundred years ago, and consists of a vessel of glass, earthenware, or similar substance, containing a weak solution of sulphuric acid. In the solution a strip of copper and a strip of pure zinc (which have been previously well cleaned) are placed so that they are not in contact with each other. A piece of copper or other conducting wire is attached to the top of each metal strip, and the cell is ready for use.

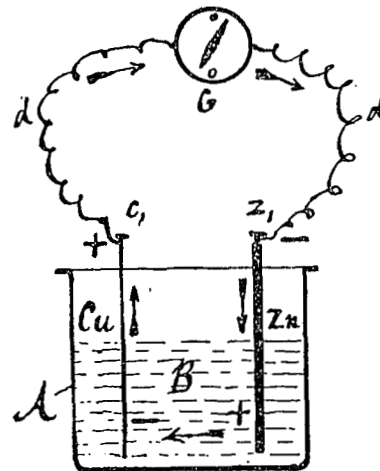


FIG. 5.—SIMPLE VOLTAIC CELL.

Fig. 5 represents diagrammatically a simple voltaic cell in action. A is the containing vessel or jar, B is the exciting solution, Zn is the zinc plate, Cu the copper plate, c_1 is the positive pole, z_1 the negative pole, G is the galvanometer connected by the wires *dd*.

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